Type 2 Rising
A Contribution to a DG Account of Discontinuities

Timothy Osborne
tjo3ya@yahoo.com

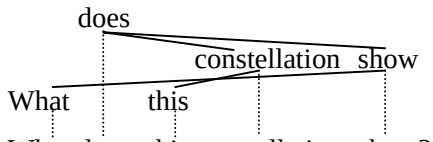
Abstract

This contribution examines discontinuities in DG. Discontinuities are addressed in terms of *catenae* and *rising*. The catena is defined as A WORD OR A COMBINATION OF WORDS THAT IS CONTINUOUS WITH RESPECT TO DOMINANCE. The definition identifies any tree or subtree of a tree as a catena. Rising occurs when a governor fails to dominate one (or more) of its governees. Two sorts of rising are distinguished: type 1 and type 2. Type 1 rising obtains when the risen catena is a constituent, whereas type 2 rising obtains when the risen catena is a non-constituent. The Rising Principle expresses the main trait of instances of rising. Discontinuity sorts (e.g. *wh*-fronting, topicalization, scrambling, extraposition, NP-internal displacement) are classified in terms of type 1 and type 2 rising.

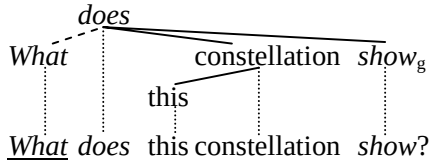
1 Introduction

Many dependency grammars (DGs) address discontinuities in terms of a flattening of structure. A displaced unit takes on a word as its head that is not its governor. Example (1a) illustrates a standard *wh*-discontinuity and example (1b) shows the manner in which the discontinuity is "overcome":

(1)



a. What does this constellation show?



b. *What* *does* this constellation *show*?

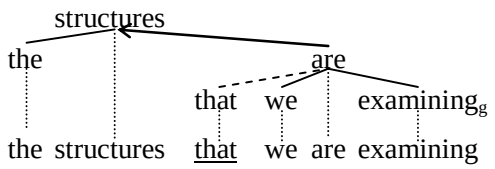
Tree (1a) illustrates a typical projectivity violation (=discontinuity). The fronted *wh*-element is separated from its governor in such a manner that crossing lines obtain in the tree. The tree in (1b) shows the manner in which the crossing lines are "remedied". The displaced unit takes on a word as its head that is not its governor.

The tree conventions shown in (1b) follow Groß and Osborne (2009). The dashed dependency edge indicates the presence of rising by which the discontinuity is overcome; the underline marks the displaced unit; the g subscript marks the governor of the displaced unit; and the italics mark the chain (=catena) of words the end points of which are the displaced unit and the governor of the displaced unit. These conventions will become clear as the discussion continues.

The flattening of structure illustrated in (1b) represents a widespread approach to discontinuities in DGs, although the terminology certainly varies: Hudson (2000:32) employs the term "raising" to address such constellations; Duchier and Debusmann (2001) use the term "climbing"; Gerdes and Kahane (2001) assume "emancipation"; Bröker (2003:294) posits "lifting". Eroms and Heringer (2003:26) suggest movement and "adjunction"; and Groß and Osborne (2009) posit "rising". This contribution follows the terminology of the latter. Discontinuities are addressed in terms of *rising*. While the accounts of these linguists certainly vary, the underlying idea pursued is consistent. This idea is that a flattening of structure occurs in order to overcome projectivity violations.

While there seems to be a measure of agreement concerning the manner in which DGs should address discontinuities like the one shown in (1), there are other structures involving discontinuities that pose major challenges and for which there seems to be much less consensus about the correct analysis. Consider, for instance, the structural analysis of the following example involving a relative clause:

(2)

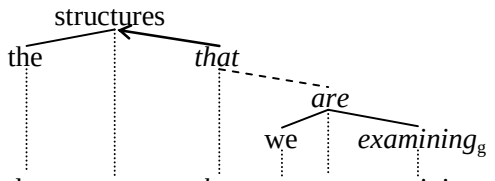


a. the structures that we are examining

The arrow dependency edge identifies an adjunct (as opposed to an argument). While the tree conventions shown again follow Groß and Osborne (2009), the actual hierarchy of words assumed is similar to proposal by Kunze (1975:160); the finite verb is seen as the root of the relative clause (not the relative pronoun).[1]

The difficulty with the analysis in (2a) is that there are indications that the relative pronoun should be the root of the relative clause, not the finite verb. In German for instance, the presence of a relative pronoun evokes VF (=verb final) order just like subordinators do. Since subordinators are unanimously viewed as the root of the clause they introduce, the inference is that relative pronouns should also be the roots of the clauses that they introduce. This insight motivates the following structural analysis of (2):

(2)



b. the structures *that* we *are examining*

The relative pronoun is now the root of the relative clause. The major difference between (2a) and (2b) is that the displaced unit, i.e. *that*, in (2a) is a constituent (=a complete subtree), whereas it alone is a non-constituent in (2b) (because it dominates other words).

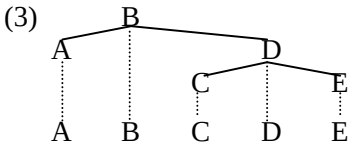
This contribution argues that the analysis in (2b) should be preferred over the analysis in (2a). This situation necessitates that the theory distinguish between two types of discontinuities. Discontinuities like the one in (1b) are instances of *type 1 rising*, whereas discontinuities like the one in (2b) are instances of *type 2 rising*. The defining trait of type 1 rising is that the risen unit is a constituent (=a complete subtree), whereas the risen unit of type 2 rising is a non-constituent. Since type 2 rising is more likely to be controversial for DG theory, this contribution focuses more on it. The data examined are mostly from English and German.

2 Catenae

Before exploring the distinction between type 1 and type 2 rising, the fundamental unit of syntactic analysis assumed in the current DG must be established. Following O'Grady (1998), Osborne (2005), and Osborne et al. (in press), the *catena* (Latin for 'chain', plural *catenae*) is posited as the fundamental unit of syntactic analysis.[2] The catena is defined as A WORD OR A COMBINATION OF WORDS THAT IS CONTINUOUS WITH RESPECT TO DOMINANCE. This definition identifies any dependency tree or any subtree of a dependency tree as a catena.

The catena unit is illustrated using the following abstract structure:

(3)



The capital letters represent words. The following 17 combinations qualify as catenae: A, B, C, D, E, AB, BD, CD, DE, ABD, BCD, BDE, CDE, ABCD, ABDE, BCDE, and ABCDE. The following 14 combinations, in contrast, qualify as non-catenae: AC, AD, AE, BC, BE, CE, ABC, ABE, ACD, ACE, ADE, BCE, ABCE, and ACDE. As the number of words increases, the percentage of non-catena combinations increases.

Given a theory neutral definition of the constituent (=A WORD/NODE PLUS ALL THE WORDS/NODES THAT THAT WORD/NODE DOMINATES), there are five constituents in (3): A, C, E, CDE, and ABCDE. Examining the combinations that qualify as catenae and that qualify as constituents, one sees that every constituent is a catena, but many catenae are not constituents. Thus THE CONSTITUENT IS A SUBTYPE OF THE CATENA.

[1] The term "root" is used throughout to denote the one word in a given unit (e.g. constituent, catena) that is not dominated by any other word in that unit.

[2] O'Grady (1998), Osborne (2005), and Groß and Osborne (2009) employed the term "chain" (instead of "catena"). Osborne et al. (in press), however, replace the term "chain" with "catena" in order to avoid confusion coming from constituency-based derivational grammars, where "chain" has a much different meaning.

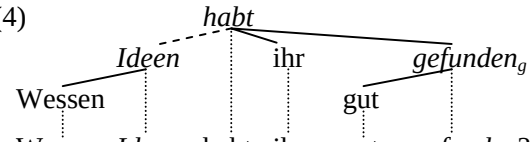
The detailed discussions of the catena unit in the sources cited at the beginning of this section establish the validity and importance of the concept. The discussion below can therefore take the concept for granted and base its account of discontinuities thereupon.

3 Type 1 rising

Type 1 rising occurs when the risen catena is a constituent. A number of discontinuity types involve Type 1 rising (e.g. *wh*-fronting in English and German, scrambling in German, and extraposition in English and German). This section briefly illustrates these discontinuity types and in so doing, establishes the particular terminology of the current DG theory of discontinuities. The tree conventions introduced with tree (1b) are again employed.

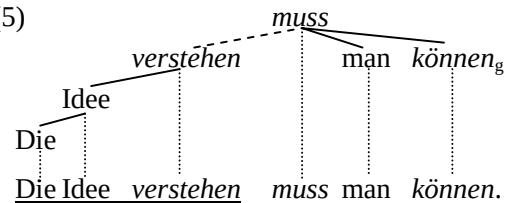
Example (1b) illustrated *wh*-fronting in English. The next two examples illustrate *w*-fronting rising and topicalization rising in German:

(4)



Wessen *Ideen* habt ihr gut *gefunden*?
whose ideas have you good found
'Whose ideas did you find good?'

(5)

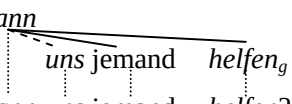


Die Idee *verstehen* *muss* man *können*.
the idea understand must one can
'One has to be able to understand the idea.'

As mentioned above, the dashed dependency edge indicates the presence of rising, the underlined unit is the *risen catena*, the g subscript marks the governor of the risen catena, and the italicized words constitute what is now called the *rising catena*.

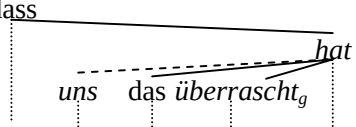
The following examples illustrate scrambling rising in German (Scrambling does not exist in English, of course):

(6) *Kann*



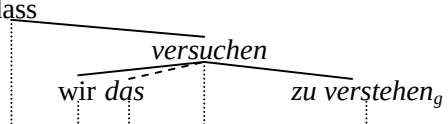
Kann *uns* jemand *helfen*?
can us someone help
'Can someone help us?'

(7) dass



dass *uns* das *überrascht* *hat*
that us that surprised has
'that that surprised us'

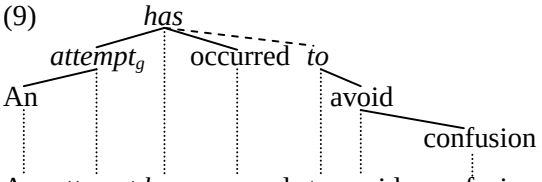
(8) dass



dass wir *das* *versuchen* *zu verstehen*
that we that try to understand
'that we tried to understand that'

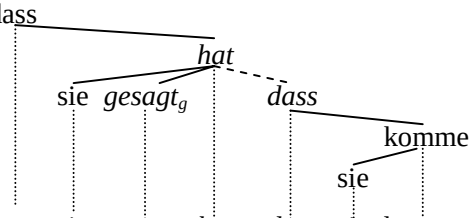
And the following examples illustrate extraposition rising:

(9)



An *attempt* *has* occurred *to* avoid confusion.

(10) dass



dass sie *gesagt* *hat*, *dass* sie komme
that she said has that she comes
'that she said that she will come'

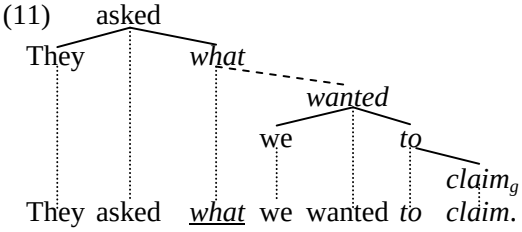
These instances of rising all show the major trait of type 1 rising. This trait is that the risen catena is a constituent (as defined above). While there are many aspects of these discontinuity types that deserve attention, the main point that is pertinent for the account of type 2 rising below has now been established. This point is that the risen catena of type 1 rising is a constituent.

4 Type 2 rising and the Rising Principle

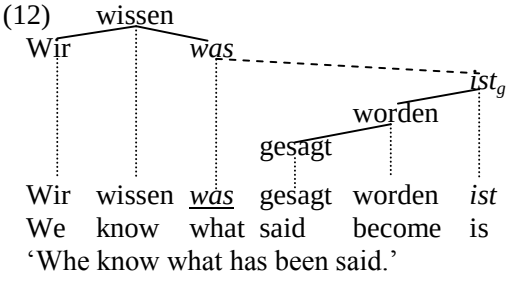
The instance of type 2 rising illustrated with (2b) shows the risen catena as a non-constituent. This aspect of type 2 rising allows one to easily distinguish the two types of rising. Any instance of rising where the risen catena is a non-constituent is type 2 rising. Type 2 rising occurs with *wh*-fronting in subordinate clauses (in indirect questions), with relative pronouns of all types, and with NP-internal displacement.

The following trees illustrate type 2 rising in indirect questions:

(11)

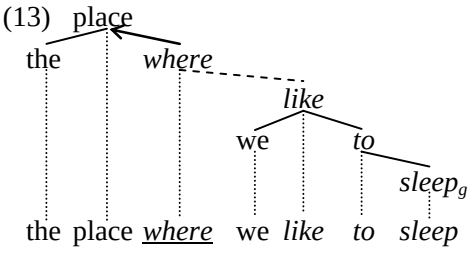


(12)

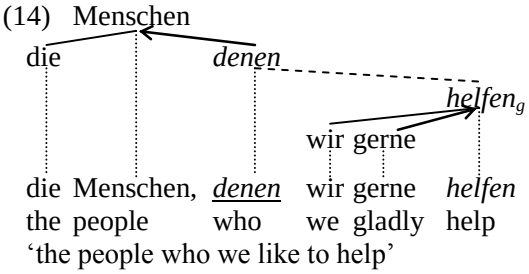


The following two examples illustrate type 2 rising in relative clauses:

(13)

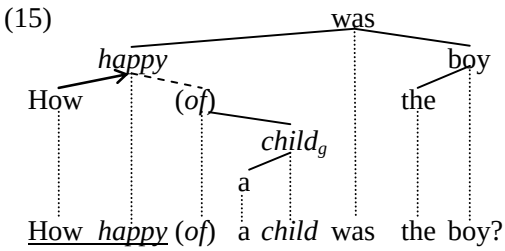


(14)

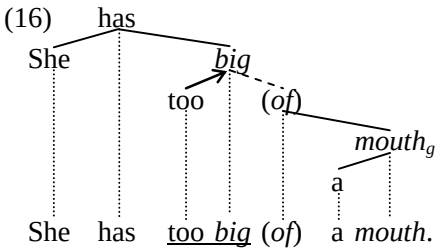


And the following two examples illustrate type 2 rising inside NPs in English:

(15)



(16)



These two examples show type 2 rising within an NP. The parentheses indicate that the appearance of the preposition *of* in each case is optional. The risen adjective is focused by the adverb, i.e. by *how* and *too*. When the adjective is focused in this manner, it must be fronted within the NP. Interestingly, this sort of type 2 rising is completely absent from German. The pertinent observation in this regard that there are numerous discontinuity types, and languages vary with respect to the inventory of discontinuities that they allow.

The tree conventions in these instances of type 2 rising remain consistent. The risen catena in each case is underlined; the governor of the risen catena carries the g subscript, and the rising catena is in italics. Two things should be acknowledged about type 2 rising: again that the risen catena is a non-constituent and that the root of the risen catena necessarily dominates its governor.

Comparing the instances of type 1 rising in (4-10) with the instances of type 2 rising in (11-16), one sees that in cases of type 1 rising, the head of the risen catena dominates the governor of the risen catena,[3] whereas with type 2 rising, the root of the risen catena itself dominates the governor of that risen catena. These two observations exhaust the possibilities, and they motivate the Rising Principle:

[3] The head of a given catena is the one word (outside of that catena) that dominates that catena.

Rising Principle
The head or the root of the risen catena must dominate the governor of the risen catena.

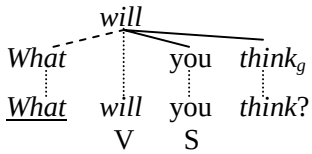
The examples above all obey this principle. Either the head of the risen catena dominates the governor of the risen catena (=type 1 rising) or the root of the risen catena dominates the governor of the risen catena (=type 2 rising). The Rising Principle is the major guideline that all discontinuities must obey. It helps limit the discontinuities that can obtain.

Since many DGs address discontinuities in terms of a mechanism like type 1 rising, type 1 rising should not be too controversial. Type 2 rising, however, is unique to the current DG. To my knowledge, no other DG has proposed something similar. Furthermore, there are some aspects of type 2 rising that generate questions about the nature of discontinuities and head-dependent relations in general. For these reasons, the following subsections motivate the current understanding of type 2 rising.

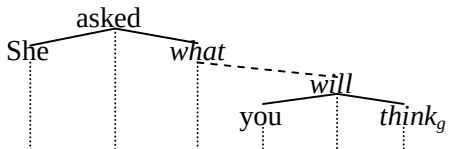
3.1 SV order

The first observation that supports type 2 rising comes from word order across direct and indirect clauses in English. Direct constituent questions in English can have VS order, where V is an auxiliary. In indirect questions in contrast, SV order obtains. These facts are illustrated with the following examples:

(17)



a. *What* *will* you *think*?
V S

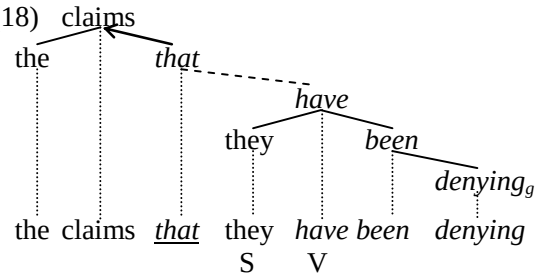


b. She asked *what* you *will* *think*?
S V

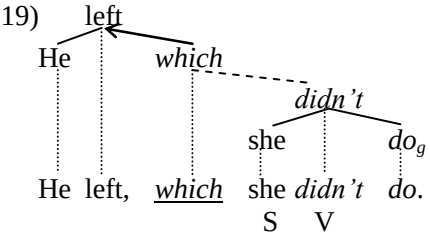
The direct question in (17a) has VS order, where V is an auxiliary verb. The indirect question (17b), in contrast, has SV order. Both sentences necessarily involve a discontinuity. By assuming the distinction between type 1 and type 2 rising, the VS vs. SV distinction can be accommodated. If type 1 rising were the only type of rising that the theory had at its disposal, accommodating the contrast in a principled manner would be difficult.

The SV order of indirect questions is also seen in relative clauses of all sorts. This fact supports the type 2 rising analysis of these clauses.

(18)



(19)



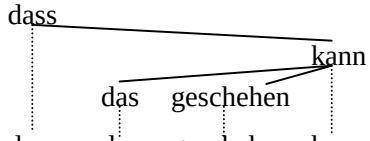
The same SV order seen in the indirect questions is present in relative clauses like these. The combination SV-order plus pronoun fronting is thus an indication of type 2 rising.

Beyond the VS vs. SV distinction, subcategorization considerations support type 2 rising. Question verbs (e.g. *ask*, *wonder*, *inquire*, *know*, etc.) subcategorize for an indirect question, whereby the question word is the most distinctive trait of a question (direct or indirect). And regarding relative clauses, the relative pronoun is the most distinctive word of a relative clause, so it makes sense that it should be the root of the relative clause.

3.2 VF order

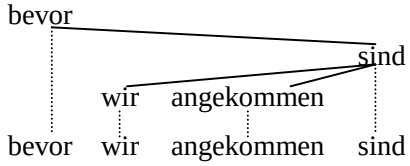
VF order in German subordinate clauses provides similar support for type 2 rising. Type 2 rising in many subordinate clauses in German provides a principled means of accounting for VF (=verb final) order. An initial observation in this regard is that the appearance of a typical subordinator evokes VF order, e.g.

(20) dass



'that that can happen'

(21) bevor

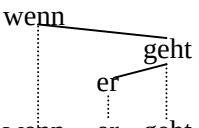


'before we arrived'

The subordinators *dass* 'that' and *bevor* 'before' evoke VF order, which means the finite verb appears in clause-final position. Since this word order occurs with indirect questions and relative clauses as well, one can assume that such subordinate clauses should have a similar structure.

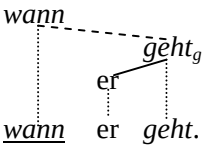
But only if type 2 rising is allowed can the structure of all VF clauses be parallel. Examine the parallelism of structure across the following clauses:

(22)



(Ich bleibe nicht,) wenn er geht.
I stay not if he goes
'I won't stay if he goes.'

(23)

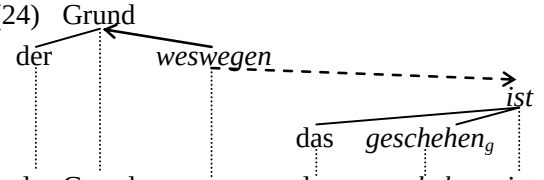


(Ich weiß nicht,) wann er geht.
I know not when he goes
'I don't know when he is going.'

The closeness in form and meaning across the two clauses suggests strongly that they should have similar structures. The subordinator *wenn* 'when/if' and the interrogative proform *wann* 'when' convey similar meanings and they both evoke VF order. Type 2 rising allows for the parallelism to be acknowledged in the structure. If type 1 rising were all the theory had at its disposal, there would be no way to establish the desired parallelism across all VF clauses.

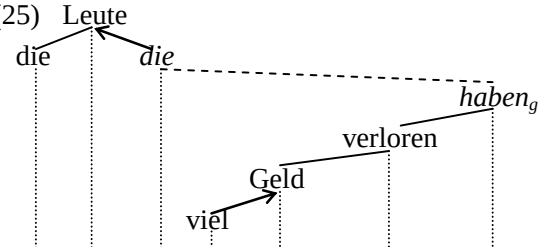
The same observation speaks for type 2 rising in relative clauses in German. The appearance of the relative pronoun evokes VF order, which means that the relative proform should appear in a position where it can have this impact on the clause it introduces, e.g.[4]

(24) Grund



der Grund, weswegen das geschehen ist
VF
the reason why that happened is
'the reason why that happened'

(25) Leute



die Leute die viel Geld verloren haben
VF
the folks that much money lost have
'the folks that lost a lot of money'

The relative proforms *weswegen* 'why' and *die* 'that/who' evoke VF order. They should therefore appear in a position where they can exert this influence. Assuming type 2 rising allows them to serve as the root of the clause that they introduce.

As mentioned above, distributional considerations provide a second source of support for type 2 rising in indirect questions and relative clauses in German. The defining trait of these clauses is the *wh*-element or relative proform. Since the presence of these elements influences greatly the distribution of the clauses in which they appear, granting them root status in the clause is appropriate.

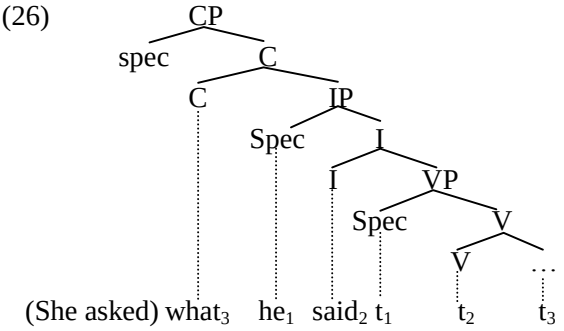
[4] The dependency arrow connecting *weswegen* to *ist* indicates that *weswegen* is an adjunct. Since the arrow always points away from the adjunct towards the governor of the adjunct, the arrow points downwards in this case.

3.3 Constituency-based hierarchies

A third observation supporting type 2 rising is of a much different nature (from the previous two observations). This third observation concerns the analysis of indirect interrogative clauses and relative clauses in constituency grammars (as opposed to in DGs). Constituency grammars of the GB/MP tradition see the *wh*-element or relative proform occupying the head position of the clause, e.g. the C position of CP. The type 2 rising analysis therefore mirrors this analysis of the GB/MP tradition.

The point is illustrated with the following GB analysis of a simple indirect question.

(26)



The details of this analysis (e.g. the traces) are not important for the matter at hand. What is important is the surface hierarchy shown. The *wh*-element *what* occupies C, whereby CP, the maximal projection of C, is the root node of the entire structure. This constituency-based analysis is therefore analogous to the DG type 2 rising analysis now under consideration.

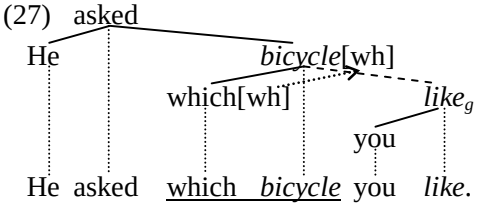
The type 2 rising analysis therefore opens the door to the massive body of literature on subordinate clauses in constituency-based systems. Many of the insights gained by the constituency-based systems are now applicable to dependency-based systems (that assume type 2 rising). A bridge of sorts now spans the two traditions (at least in this one area).

3.4 Pied-piping

Pied-piping in subordinate clauses presents a difficulty for the current analysis in terms of type 2 rising. The seriousness of this difficulty should not, however, be overestimated, since pied-piping challenges most analyses regardless of whether (something like) type 2 rising is assumed or not. The analysis of pied-piping that is now proposed assumes that *wh*-features and relative proform features can in a sense percolate up a catena to a higher node.

Interrogative verbs subcategorize for a word with a *wh*-feature. When pied-piping occurs, this feature has percolated upward to the root of the pied-piped catena, e.g.

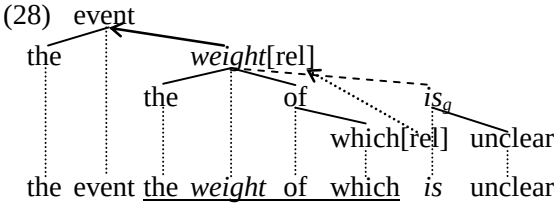
(27)



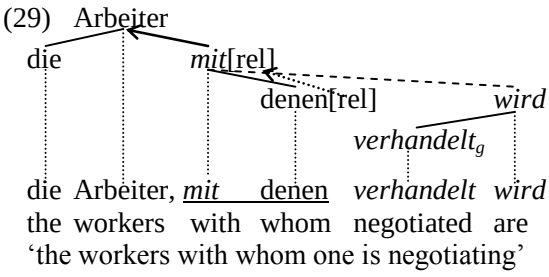
The *wh*-feature associated with *which* percolates to the root node of the risen catena. How exactly this percolation should be conceived of is not clear at this point, but that some sort of percolation mechanism is necessary is apparent. In fact regardless of the particular approach at hand, this passing of information up the structure is needed for pied-piping in general, in matrix as well as in embedded clauses.

Two more examples involving relative pronouns further illustrate the mechanism:

(28)



(29)



In these cases, the feature [rel] (indicating the presence of a relative pronoun) must percolate to the root node of the clause. By doing so, this feature is in a position to elicit the obligatory SV order of English or VF order of German associated with relative clauses.

Worth emphasizing again is that no matter the approach, some sort of percolation mechanism is needed to accommodate pied-piping. This

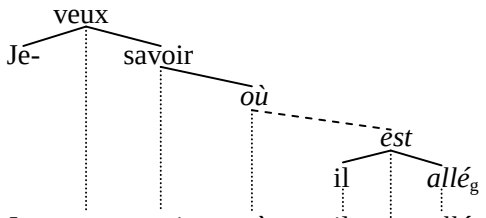
necessity is consistent across matrix and embedded clauses.

4 Rising in other languages

The discussion so far has focused on type 2 rising in English and German. The question arises as to whether type 2 rising exists in other languages. I believe that it does. Any time a *wh*-word or relative proform (or the encompassing pied-piped expression) must introduce a clause, one can make a case for type 2 rising. The discussion now briefly considers examples from French and Russian. These languages also exhibit type 2 rising.

The following example from French illustrates type 2 rising in an embedded interrogative clause:

(30)



a. Je- veux savoir où il est allé.
I want to.know where he is gone
'I want to know where he went.'

b. *Je veux savoir il est allé où ?

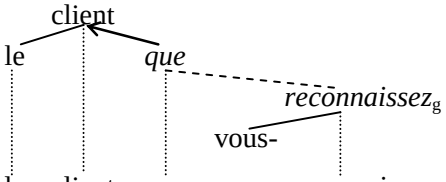
c. *Je veux savoir où est-il allé.

The lack of vertical projection edge but presence of a hyphen on *Je-* identifies *Je-* as a clitic. This aspect of the tree is not pertinent to the point at hand and is therefore taken for granted.

The question word *où* is fronted in the relative clause in (30a). When this fronting fails to occur, the result is bad, as illustrated in (30b). And sentence (30c) demonstrates that fronting is incompatible with subject-auxiliary inversion of the sort that one encounters in matrix questions in French. These data can be accommodated if type 2 rising is seen as obligatory in embedded interrogative clauses in French (just like it is in such clauses in English and German). Note as well that subcategorization requirements in French in such cases are the same as in English and German. Since the matrix predicate subcategorizes for an interrogative element, it makes sense to view the *wh*-element as having risen in the embedded clause to a hierarchical position that allows the subcategorization requirement of the matrix predicate to be satisfied.

The following example contains a standard relative clause:

(31)



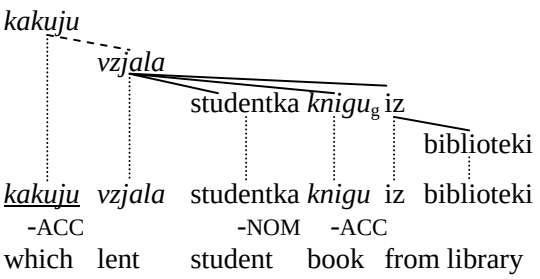
a. le client que vous reconnaissez
the client that you recognize

b. *le client vous reconnaissez que.

As in English and German, the relative pronoun must undergo type 2 rising. If it does not (i.e. it remains in situ), the result is clearly unacceptable, as example (31b) shows. Based on such data, one can conclude that type 2 rising is occurring consistently in the same environments across English, German, and French (and certainly across many other languages as well).

The following example provided by an anonymous reviewer illustrates an embedded interrogative in Russian:

(30) Skazhi emu,
tell him



kakuju vzjala studentka knigu iz biblioteki
-ACC -NOM -ACC
which lent student book from library

'Tell him which book the student checked out of the library.'

The interrogative element *kakuju* 'which' must be fronted within the embedded interrogative clause, a fact that is consistent with an analysis in terms of type 2 rising.

The interesting aspect of this example is that the interrogative word *kakuju* fails to pied-pipe its governor *knigu*. Note that in English, French, and German, such sentences are bad, e.g. **Tell him which the student checked out book from the library*. This contrast across the languages is explained in terms of Ross (1967)

left branch condition. Languages like English, German, and French cannot extract an element on a left branch out of an NP. Such cases require pied-piping, e.g. *Tell him which book the student checked out of the library*. Apparently, the left branch condition is not in force in Russian. This fact should perhaps not be a surprise, since the word order of Slavic languages like Russian is known to be much freer than that of the Germanic (and Romance) languages.

In sum, there is evidence that type 2 rising is the key to producing a principled DG analysis of many embedded clauses across numerous languages.

7 Conclusion

This contribution has provided a DG account of discontinuities in English and German. Displaced units are addressed in terms of catenae and rising. Two types of rising are acknowledged: type 1 and type 2. Since many DGs posit some mechanism akin to type 1 rising, it should not be too controversial. Type 2 rising, however, is unique to the current DG. Type 2 rising occurs when the risen catena is a non-constituent.

By acknowledging type 2 rising, DG is in a position to address all discontinuities in a principled fashion. All displacement obeys the Rising Principle, which requires that either the head (type 1) or the root (type 2) of a risen catena dominate the governor of that risen catena. This principle significantly limits the type of discontinuities that the grammar allows. The second half of the discussion concentrated on aspects of type 2 rising. Word order considerations (SV, V2, VF) provide the primary support for type 2 rising.

Finally, something should be said about rising catenae. This concept was introduced and shown in the trees (via italics), but almost nothing has been said about why the concept is important. A more comprehensive account of discontinuities would show that each specific discontinuity type (*wh*-fronting, topicalization, scrambling, extraposition, NP-internal displacement) can be described and explained in terms of the rising catenae that each allows. Since the concept is important in this regard, drawing attention to it here was warranted.

References

Bröker, N. 2003. Formal foundations of dependency grammar. Ágel, V. et al. (eds), *Dependency and valency: An international handbook of contemporary research*, vol. 1, 294-310. Berlin: Walter de Gruyter.

Duchier, D. and R. Debusmann. 2001. Topology dependency trees: a constraint based account of linear precedence. Proceedings from the 39th annual meeting of the Association Computational Linguistics (ACL) 2001, Toulouse, France, 180-187.

Eroms, H.-W. and H. J. Heringer. 2003. Dependenz und lineare Ordnung. Ágel, V. et al. (eds.), *Dependency and valency: An international handbook of contemporary research*, vol. 1, 247-262. Berlin: Walter de Gruyter.

Gerdes, K. and S. Kahane. 2001. Word order in German: A formal dependency grammar using a topology model. Proceedings from the 39th annual meeting of the Association Computational Linguistics (ACL) 2001, Toulouse, France, 220-227.

Groß, T. and T. Osborne 2009. Toward a practical DG theory of discontinuities. *Sky Journal of Linguistics* 22. 43-90.

Hudson, R. 2000. Discontinuities. Kahane, S. (ed.), *Les grammaires de dépendance* (Dependency grammars), *Traitement automatique =des langues* 41, 7-56. Paris: Hermes.

Kunze, J. 1975. *Abhängigkeitsgrammatik. Studia Grammatica* 12. Berlin: Akademie Verlag.

O'Grady, W. 1998. The syntax of idioms. *Natural Language and Linguistic Theory* 16:79-312.

Osborne, T. 2005. Beyond the constituent: A DG analysis of chains. *Folia Linguistica* 39(3-4). 251-297.

Osborne, T., M. Putnam and T. Groß. (forthcoming). Catenae: Introducing a novel unit of syntactic analysis. *Syntax*.

Ross, John R. 1967. *Constraints on Variables in Syntax*. Ph.D. dissertation, MIT.